REPORT OF WORKING PARTY ON ELECTRONIC DATA PROCESSING IN MAJOR EUROPEAN PLANT TAXONOMIC COLLECTIONS

by J. P. M. BRENAN, J. W. FRANKS, J. RAYNAL & J. CULLEN

An international conference under the auspices of the Eco-Sciences Panel of NATO was held at the Royal Botanic Gardens, Kew, England, on 3-6 October 1973 to study the scope for the use of electronic data processing methods in major European plant taxonomic collections. A preliminary account of the proceedings of this conference was published in Taxon 23 : 101-107 (1974); the full proceedings are awaiting publication elsewhere.

At this conference a number of resolutions were passed, including the following relating to the setting up of a Working Party and its tasks:

« 1. That data-banks related to plant collections should have an identical minimal standard set of descriptors, in the first instance based upon herbarium label-data.

2. That a Working Party be set up to advise, in the first instance, European herbaria upon the sets of descriptors referred to in Proposal 1.

. . . . .

5. That the Working Party, in addition to carrying out its primary function, of advising upon the sets of descriptors, should also deliberate upon software and systems, and the possibility of establishing a pilot project in one or more European institutions.

6. That the Working Party shall be empowered to consider and advise national herbaria on the appropriate steps to be taken for forming an international type-register. »

The Organising Committee of the conference itself was to be responsible for the setting up of the Working Party, « with due regard to geographical representation and technical qualifications. » The Organising Committee accordingly met on 10 December 1973 at the Linnean Society of London, considered nominations to the Working Party and made a selection. They also recommended that the Working Party should form three groups, each to consider one of the topics: descriptors, systems and software, and a type-register. The groups would be asked to appoint

their own chairmen and thus have the power to meet and act autonomously within their terms of reference.

The Working Party was constituted in the event as follows, the figures 1, 2, 3 preceding each name corresponding with the constituent groups of which they were also members (1, Systems and Software; 2, Descriptors; 3, Type-Register):

1   Dr. F. A. Bisby, University of Southampton, U.K.
     Mr. J. P. M. Brenan, Royal Botanic Gardens, Kew, U.K. (Chairman of Working Party).
3   Mr. J. F. M. Cannon, British Museum (Natural History), London, U.K.
2, 3 Dr. J. Cullen, Royal Botanic Garden, Edinburgh, U.K.
1   Mr. T. W. Davies, Organisation and Methods, Ministry of Agriculture, Fisheries and Food, London, U.K.
2, 3 Dr. J. W. Franks, University of Manchester, U.K.
3   Prof. Dr. C. Kalkman, Rijksherbarium, Leiden, Netherlands.
2   Mr. R. D. Meikle, Royal Botanic Gardens, Kew, U.K.
1, 2 Mr. J. Raynal, Muséum National d'Histoire Naturelle, Paris, France.
3   Prof. Dr. M. Riedl, Naturhistorisches Museum, Wien, Austria.

Dr. J. L. Cutbill, Sedgwick Museum, Cambridge, U.K., was subsequently coopted to the Systems and Software Group. The Groups elected the following Chairmen:

1. Systems and Software: Dr. J. W. Franks.
2. Descriptors: a) Mr. T. W. Davies, b) Mr. J. Raynal.
3. Type Register: Mr. J. Cullen.

The first full meeting of the Working Party took place at the Linnean Society of London on 5-6 February 1974. The recommendations of the Organising Committee were accepted, guidelines for the groups were agreed, and each group held independent meetings. A provisional time-table for the operation of the Working Party was agreed, with a final meeting in the autumn of 1974.

The subsequent proceeding of the Type-Register Group were, prior to the final plenary meeting, entirely by correspondence; the other two groups held meetings during the summer at Kew and in Paris. The final plenary meeting of the Working Party took place at the Rijksherbarium, Leiden, Netherlands, on 24-25 October 1974, preceded by independent meetings of the three constituent groups.

Dr. Lars Osterdahl, Swedish Museum of Natural History, Stockholm, Sweden, was invited to and attended the Leiden meeting. Dr. H. M. Burdet and Mr. A. Charpin of the Conservatoire et Jardin Botaniques, Genève, Switzerland, attended the Leiden meeting as observers.

At this stage it is a pleasant duty to thank Professor C. Kalkman, Director of the Rijksherbarium, Leiden, Professor J.-F. Leroy, Director of the Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris, and Professor J. Heslop-Harrison, Director of the Royal Botanic Gardens, Kew for facilities and hospitality given during these meetings.

Subsequent to the Leiden meeting, the chairman of each of the groups drew up a report on each of the three topics the groups were required to consider, and these reports follow this introduction.

It should be emphasised here that the groups, in spite of an overlap in

membership (definitely desirable!), met independently and kept their own minutes. Their conclusions and recommendations are offered as advice and of course cannot be mandatory. Nevertheless, it is confidently hoped that institutions and herbaria will find them of value in framing their future policy for E.D.P.

The pilot-list of types of *Papaveraceæ* drawn up by the Type-Register Group under Dr. J. CULLEN is a lengthy one, running to nearly 50 pages. This has been distributed to members of the Working Party, but as the list is still incomplete, the report of the group here is confined to the introduction to the list and the subsequent discussion of the project by the group.

It is a pleasure to thank all members if the Working Party for the time and hard work they have given, and in particular the chairmen of the groups for their invaluable coordination and for drawing up these reports.

J. P. M. BRENAN
Chairman, Working Party

REPORT OF SYSTEMS AND SOFTWARE GROUP

MEMBERS: Dr. F. A. BISBY. — University of Southampton, U.K.
Dr. J. L. CUTBILL. — University of Cambridge, U.K.
Mr. T. W. DAVIES. — Ministry of Agriculture Fisheries and Food, U.K.
Dr. J. W. FRANKS. — Manchester Museum, U.K. (Chairman).
Mr. J. RAYNAL. — Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris, France.

The group was constituted from members of the Working Party deriving from the International Conference on E.D.P. methods in European Taxonomic Collections held at Kew in October, 1973.

Four meetings of the group were held during 1974:

1. At the full Working Party meeting in London, Jan. 1974.
2. At Kew, Feb. 1974.
3. At the Laboratoire de Phanérogamie, Paris, June, 1974.
4. At the full Working Party meeting in Leiden, Oct. 1974.

The terms of reference of the group were:

1. To consider existing systems and software and to discuss the possibilities of recommendation or advice on these.

2. To consider pilot schemes.

CONSIDERATION OF TERMS OF REFERENCE (ITEM 1)

Almost all discussion at the meetings was concerned with this item. There was general agreement that it was at this stage neither practical nor desirable to recommend any one system for universal usage. It was, therefore, decided to produce an aid to those contemplating the use of E.D.P. methods. This appears below as, *E.D.P. in Taxonomic Collections — General Considerations*. It was also decided to attempt to produce a list of systems in use. This list which appears at the end of this report is based largely on the personal knowledge of the group and for this reason and due to limited time schedules it is necessarily incomplete.

It was felt that, for the purposes of improving the coverage of this list, and to act as an advisory body, it might be useful for this group to stay in being at least until a substitute body could be constituted.

CONSIDERATION OF TERMS OF REFERENCE (ITEM 2)

A meeting was held at Kew in September 1974 to consider the setting up of a pilot project using the data from the Royal Society expedition to Aldabra and from some historic material held at Kew.

Present at the meeting were: Dr. J. W. FRANKS	} Systems & Software
Dr. J. L. CUTBILL	} Group
Mr. T. W. DAVIES	}
Dr. W. CLAYTON	} (Royal Botanic Gardens,
Mr. S. RENVOIZE	} Kew)
Dr. D. B. WILLIAMS	(British Museum, Natural History)

The scope of the project was defined, and methods discussed.

Specifications of the project and estimates were prepared and submitted to the Kew authorities. J. RAYNAL is preparing specifications for a pilot project on a group of the *Cyperaceæ*, to be based on Paris.

E.D.P. IN TAXONOMIC COLLECTIONS — GENERAL CONSIDERATIONS

PROCEDURES	NOTES
1.1. Review present methods in your institution, i.e. all steps taken on entry of a specimen to the institution leading to its storage and/or incorporation in the collections; and the generation of records (card — catalogue — accession book entry, etc.).	(a) It will probably be found that there are considerable inadequacies in the existing procedures. (b) There is often an inbuilt bias towards existing methods in any institution, therefore, the group considering them should include junior members of staff and/or outsiders.

PROCEDURES	NOTES
1.2. Review the advantages and disadvantages of altering the existing arrangements to the standard where the record generated can be used as E.D.P. input if so required.	(a) Centralized entry area. (b) Problems of altering curatorial routines. (c) Use of standardized data formats. (d) Cost. (e) Staff resistance.
2.1. Consider the reasons put forward for using E.D.P. methods.	
2.2. List the advantages expected.	(a) i.e. Questions one would expect to be able to answer.
2.3. Ask: What can be done now?	
2.4. Ask : What could be done by simply implementing the changes at 1.2.	(b) If this is the same as 2.2. then there is little point in going further.
2.5. At this stage the problem may separate naturally into two parts. 1, the general consideration of E.D.P. in the collection as a whole, and 2, specific research projects and specialized operations within the whole.	(a) These may often be separately funded and organized, but compatibility with any general scheme should be an aim.
2.6. Customers: (1) Internal! Ask: How important would an E.D.P. system be to them?	(a) Many curators spend expensive time on information retrieval; an E.D.P. system should provide a better return for this time.
(2) External! Ask: How many customers? What do they want? What is their present cost to the institution?	(a) Should they be asked to pay for an improved service? (b) Will they afford it? (b) Experience has shown that catalogues and directory type listings are saleable items.
(3) Are the customers likely to want more than you offer? If so, should you build in a facility for providing extras?	

PROCEDURES	NOTES

2.7. Size of data bank. If any detailed information Service is to be offered, then the size of the source becomes a question of importance. We consider that with up to 10,000 items a data bank can be handled by manual methods but that at over this figure E.D.P. becomes essential on economic grounds alone.

3.1. Data capture. If having gone through the above exercise it is decided to go ahead with preparation for an E.D.P. scheme, the most consideration must be the method, scope and cost of data capture. This is certainly going to account for the bulk of the expenditure in any scheme and the way in which the problem is approached needs careful thought.

(a) There is a distinction to be made here between old and new records.

It is vital at this stage to consider data formats and the use of standardised recording forms.

(b) The most detailed work on this subject is that done by I.R.G. M.A. Information on this from Museums Association, 87, Charlotte Street, London WIP 2BX.

As the average record as applied to a herbarium sheet will be not more than 250 characters it is recommended that the whole of the record be captured at once.

(c) This average record length seems to be applicable to most museum specimens.

The cost of data capture will vary from institution to institution and country to country. The following formula for its estimation is suggested: Transcription of record from well written label — card — minimum content form etc. to

(a) The amount saved by extracting part of the record will be minimal. Later extraction of additional data will double costs.
(b) Cost of extraction etc. not applicable to new records (see 1.2. notes).

PROCEDURES

NOTES

machine-readable E.D.P. input = 20 records per hour at Clerical Assistant or Copy Typist rate. To this should be added the cost of finding the herbarium sheet or record; extracting from place of storage and its return after transcription.

4.1. All the processes mentioned so far can be undertaken without the use of E.D.P. Probably all of them if implemented will produce by themselves substantial benefits to the institution implementing them. The following stages will largely depend upon involvement in the use of computing services.

5.1. Data storage. Data can be stored on cards, forms, punched cards, paper and magnetic tapes or discs. The type of storage used will probably be determined by the system chosen.

(a) Data storage costs are halving every three years whilst data capture costs, being labour-intensive, are increasing.

6.1. Data manipulation on any considerable scale will involve the use of computer technology. At this stage a system review will be required.
Aspects of systems which need to be considered are:

1. Local availability of a computer on which they will run.

2. A clear understanding of the limitations of the systems offered.

(a) Fixed or variable field length.
(b) Coding or non-coding systems.
(c) Ability to hold and manipulate all data.
(d) Arrangements for maintenance and improvement of system.

PROCEDURES

NOTES

7.1. The end product. It would seem unlikely that many taxonomic institutions would require or be able to afford to hold their records in a form available for immediate computer access. It is, therefore, suggested that the record be used to produce directory type listings for which it is anticipated there would be a ready market.

Dr. J. W. FRANKS,
Chairman, Systems and Software Group.

LIST OF EDP PROJECTS AND SYSTEMS OF INTEREST TO TAXONOMISTS

It is realised that this list is imperfect, and that there may be schemes in operation that have not been given much publicity and that have thus been missed. Nevertheless, it is hoped that this communication will be valuable.

NAME AND LOCATION OF PROJECT OR SYSTEM	DIRECTOR OF PROJECT, WHERE KNOWN
SELGEM–U.S. National Museum of Natural History, Washington, U.S.A. (see also MESH Newsletters)	J. F. Mello
TAXIR–University of Colorado, U.S.A. (widely used in Universities)	D. J. Rogers
Flora of Veracruz Programme, National University of Mexico	A. Gomez Pompa
Data-bank for taxonomic purposes at Bolus Herbarium, University of Cape Town, South Africa	A. V. Hall
Flora North America—I.B.M. generalised information system (not now in operation)	S. G. Shetler
Biological Records Centre, Monks Wood, U.K. (uses 80-column cards)	F. H. Perring
British Antarctic Survey, Botanical Data Bank, U.K.	S. W. Greene
Cambridge Geological Data System, Sedgwick Museum, Cambridge, U.K.	J. L. Cutbill

Cambridge Geological Data System, British Museum (Natural History), all departments	D. B. Williams
Living plants record system, Royal Botanic Garden Edinburgh, U.K. (uses 80-column cards)	J. Cullen
GIPSY—a taxonomic system, University of Oklahoma, U.S.A.	J. Sweeney
Museum Computer Network, New York Art Museums, U.S.A.	D. Vance
Commonwealth Agricultural Bureaux, U.K. computer-based services	
MEDLARS	
SCI. SEARCH 2 ⎫ British Library, U.K.	
MEDLINE ⎭	
CABER ⎫ Forestry Commission, U.K.	
DISCUS ⎭	
Zoological Record, Royal Zoological Society, London, U.K.	
Economic Abstracts, University of Norwich, U.K.	J. Barkham

For further general information, see CROVELLO & MACDONALD *in* Taxon **19** : 63-67 (1970) and also J. L. CUTBILL, Data Processing in Biology and Geology (1971, Academic Press, London and New York).

REPORT OF DESCRIPTORS' GROUP

The word " descriptor " covers the different categories of information making possible a reference to a given specimen of a collection. For instance a collector's name, a locality of collection, etc., are descriptors.

Within the Working Party on E.D.P. in European herbaria, a group was formed on Feb. 5, 1974 in London, which was more especially concerned with the definition of descriptors. This Group met again twice during the year in Paris and Leiden. While organizing detailed discussions on its specific problems, contact was maintained with the other Groups, in particular the Systems and Software Group; this link is important because of the numerous interrelations between the topics, such as the bearing ot technical and economic constraints on the possibilities of a fruitful treatment of the descriptors.

Thanks to this flexible organization, quick progress towards a general agreement was made; the last meeting in Leiden (Oct. 1974) made possible a settlement about the required set of descriptors to record in the individual collections, within the project of internationally exchangeable data capture. These conditions required are below.

If one tries to make a complete list of possible descriptors, it first

appears to be very difficult, especially if one wants to include morphological descriptors of the specimens.

However, the nature of the descriptors useful to a given project is the result of the possible questions asked to the data bank, that is of the project itself. A limited but very specialized project may use many different descriptors; on the other hand projects operating on a large part, or even on the whole, of a large herbarium, will use only, for economic reasons, a restricted number of essential descriptors. Owing to its international role, the Working Party felt more especially devoted to the definition of such a minimal set of descriptors, minimal but essential and common to all sorts of possible projects.

Consequently, the descriptors here listed are by no means considered by the Group as the only useful ones, but as a skeleton without which no sensible automated treatment of the information could be performed.

EXAMPLES OF PROCESSING

The products of the data processing may be very diverse; we shall only mention here the more frequent ones:

— Monographic listings of the specimens classified taxonomically according to a preestablished or alphabetical list, within every taxon the specimens being listed either by collectors' names or geographically.

— Floristic listings of the taxa existing in a given country, with or without listing of the specimens and localities. Related to this is the frequent question: "Does this species (or this genus) exist in that country?".

— Compilation of botanical gazetteers.

— Reconstruction of collectors' itineraries.

These two last examples do not constitute goals per se; however, they are very often most useful precursors to biogeographical work, especially accurate distribution maps, which prove so essential today. These steps nowadays achieved by time-consuming and expensive manpower would greatly benefit from automated treatment.

— Automated plotting of distribution maps.

— Chronological lists of collections of a given species and lists of endangered species.

— Lists of montane taxa.

— Lists for curatorial use, such as lists of ancillary collections (spirit collections, slides, etc.) arranged according to the corresponding herbarium sheets.

Of course, many other kinds of treatments can be performed, especially if morphological descriptors are included. But such projects would be of a specialized nature; for the reasons exposed above, morphological descriptors have been excluded from the restricted set considered by the group.

FORMAT OF THE INFORMATION

Once a set of descriptors is fixed for a given project, the question arises of the format in which the data will be recorded. This format depends on the system used, and can be classified under three general headings:
— Full record without limitation of length (variable fields);
— Full record within a given maximum length (fixed fields);
— Coded record.

The coded record has been used extensively in the past, both in mechanical treatments, and also in early electronic data processings. Nowadays some systems operate with such codes (e. g. a code number for every species, or for every collector's name, etc.); however, the technical possibilities of modern computers make this preliminary coding —which may be a source of errors— generally useless.

Thus the Working Party did not consider the problem of coding, nor sought for a standardized and generally accepted list of codes.

The question of fixed- or variable-length fields is also a matter of local decision, depending on the available computers and systems; the Descriptors Group did not decide anything about it.

So, whatever the local conditions of processing, the information exchangeable between different data banks ought to be clearly expressed.

A last important point concerning the interrelations between descriptors and systems is connected with the sort of processing wanted. The ideal data bank would permit direct access and sorting of every kind of descriptor. However, for economic reasons, it may be advisable to restrict the " retrievability " only to certain descriptors, and to leave the remaining information as ancillary descriptors, stored by the machine but not directly accessible or sortable; such information may be outprinted as a complement to the primary descriptors, but cannot be individually reached or sorted. In this category may enter for instance authorities of scientific names, ecological or descriptive information, etc.

ESSENTIAL DESCRIPTORS

The essential descriptors may be classified in three main headings:
— Curatorial identifiers;
— Taxonomic and nomenclatural identifiers;
— Locality descriptors.

I. CURATORIAL DESCRIPTORS

11. *Herbarium code*
When processing data which may come from different data banks or herbaria, any record must indicate the herbarium where the specimen is kept. This descriptor does not raise any problem as a standardized list of herbarium abbreviations already exists.

12. *Accession number*

A unique accession number, associated with the herbarium code, unequivocally designates a given herbarium sheet. Such a unique curatorial identifier is highly desirable for both processing and curatorial purposes. Some herbaria already use such a numbering system for their specimens and the number will be directly recorded in the bank. In other instances, the progressive allocation of such numbers to herbarium specimens as the data banking proceeds will be an useful by-product from the curatorial viewpoint.

13. *Collector(s) name(s)*

Collectors' names, owing to the bulk of information they implicitly contain (country and time of collecting, place(s) where the collections are kept), and their general use, obviously belong to the essential necessary descriptors. A provision has to be made for collections made jointly, and also for intermediate persons or bodies (e. g. X in Y, or X in FHI...). Due to the many homonyms, initials of collectors should be cited.

14. *Collection number*

The collection number (or sometimes the number in a private collection), associated with the collector's name, generally provides sufficient information enabling the different parts of a sample distributed to different herbaria to be linked. Sometimes this fails in old collections, or even today in some amateurs' collections, when no collection number has been given, or —a worse case indeed— when the same number has been allocated to different samples collected in various places at various dates but once considered as belonging to the same taxon. In this last instance the number is more a species number than a collection one; the sample can no longer be identified with certainty unless other information, such as place and date of collection, is added. This is a strong additional reason to consider this last kind of information as essential (see below).

15. *Ancillary collections indicator*

A simple indicator for ancillary collections (spirit material, photographs, drawings, microscopic slides, living collections, etc.) has been judged very useful; the complete designation of these ancillary collections may be added either as fully retrievable descriptors or as complementary non-retrievable information.

2. TAXONOMIC AND NOMENCLATURAL DESCRIPTORS

21. *Family name*

It seems necessary to indicate to wbich family a specimen belongs as soon as one wants to outprint, for instance, a list of various specimens in taxonomic order. The only way to avoid recording of the family name would be to use a memorized synopsis of generic names associated with

their corresponding families, a device which is not necessarily possible with all systems.

22. *Scientific name*
    221. Generic name
    222. Specific epithet
    223. Infraspecific epithet
    224. Infraspecific rank

These four items constitute the most abbreviated designation of the taxon with which the specimen has been identified. The identification itself should be the one obtained fom the last revision of the specimen; no provision is made, as far as essential descriptors are concerned, for previous identifications. It must be understood that for specialized projects such as type-registers a retrievable record of the name typified by the specimen is compulsory. In this particular instance, this name may even be more important than the up-to-date identification.

Authors' names have been judged as unnecessary as retrievable descriptors; they may advantageously be added as complementary information.

Another interesting item is the name of the identifier, but it does not seem to be an essential retrievable descriptor.

23. *Type indicator*
To indicate whether the specimen is or is not a type has been considered as essential, but any fuller information about the typified name, the literature, or any other items which may be considered as essential for specialized projects (type-registers) are excluded as already mentioned.

3. GEOGRAPHICAL DESCRIPTORS

The Group has discussed at length the nature and the degree of detail necessary for the geographical descriptors taken from herbarium labels. An agreement has been reached on the following points:

31. *Country*
Notwithstanding the inconveniences which may raise, it appears that the country of origin is one of the most necessary and useful bits of information, especially for all floristic works. The Group is fully aware of the trouble one may have in some parts of the world where boundaries changed frequently in the past (e. g. Central Europe); however, the possible resulting mistakes or inaccuracies are not judged as a considerable hindrance compared with the great practical value of this descriptor.

Several members of the Group wish that the geopolitical localization of the specimens were more complete and hierarchized (province, district, etc.). Such additional descriptors are indeed useful in some kinds of specialized projects, but their consistent use at an international scale does not look essential.

32. *Geographic coordinates*

The Group has weighed the respective advantages of different systems in use for an accurate plotting of botanical samples; it has especially discussed the merits of grids such as the ones largely used in the recent years. The Group felt that the system which was the only really universal as well as the simplest system, useful both for manual plotting as well as for automatic processing, remained geographic coordinates (latitude and longitude). A precision of a minute of arc (i.e. less than 2 km) in the figures has been judged necessary and sufficient.

The strongest objection to the use of grids where a specimen is located only by a presence/absence datum in a more or less large rectangular area, is that one can always translate coordinates into such a grid, but the reverse operation is impossible at the degree of precision required.

33. *Locality name*

It seems necessary to record in a retrievable way the full name of the locality of collection (village, valley, mountain, beach, etc.). The needs for citation of such names in many kinds of works, their use in compiling and using botanical gazetteers, the evident help they provide in identifying old collections without numbers, are as many reasons for considering locality names as essential descriptors.

34. *Collection date*

This item may be important from several points of view: history of the records, reconstruction of itineraries, phenology, identification of specimens without number, etc. Storing this information is not expensive hence its recording as an essential descriptor has been found advisable.

35. *Altitude*

Despite its connection with ecology rather than with geography itself, this ‘ third coordinate ’ is considered as useful and inexpensive enough to be included among essential descriptors. The precision needed is of 100 m.

It is felt that it is impossible to record ecological data such as topography, plant communities, soils, etc. in a easily retrievable form, since there are still too many disagreements between ecologists on generally applicable descriptive terms for plant formations.

Such is the relatively short list of the information the recording of which in any data bank is considered as absolutely compulsory. Of course, this does not mean that only the specimens carrying this complete information should be recorded. Many specimens, especially older ones, carry only a limited amount of information and sometimes lack some of the more essential data, such as locality or even country, or date. Such specimens ought to be recorded, the missing information being left blank. All the present essential descriptors will be recorded. It should be noted

that some information may at a later stage be added to incomplete sets as processing proceeds (e. g. unknown localities located later thanks to itinerary reconstruction).

It is hoped that a by-product of such an effort of complete recording of the necessary information will be a standardization of collectors' notes. Many institutions already use collectors' notebooks of which collectors just fill in blanks on forms; such a method is to be encouraged.

PILOT SCHEMES

Two pilot schemes have been proposed to the Working Party; one is a floristic approach and deals with the whole vascular flora of a restricted area (Aldabra Island Project); the other is restricted taxonomically to one or a few genera but geographically spreads over a continent (African Cyperaceæ). It is hoped that these projects will be started and give at least preliminary results before Leningrad Botanical Congress. They will permit practical and efficient testing of the systems operated and of the set of essential descriptors here proposed.

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J. RAYNAL,
Chairman, Descriptors Group.

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REPORT OF TYPE-REGISTER GROUP

Following an International meeting on Electronic Data Processing in European Botanical collections, held at Kew in October 1973, a Working Party was set up to consider (*inter alia*) the production of a register of type specimens held in European herbaria. The members of the Type Register Group of the Working Party were: J. F. M. CANNON (British Museum (Natural History), London), J. CULLEN (Royal Botanic Garden, Edinburgh), H. DEMIRIZ (Istanbul University), C. KALKMAN (Rijksherbarium, Leiden) and H. RIEDL (Naturhistorisches Museum, Wien).

At their first meeting, the group considered previous attempts at producing a Type Register (mostly those discussed by SHETLER in *Smithsonian Contributions to Botany 12*, 1973), and decided that the experience represented by these, which were all in a purely American context, was not adequate for them to recommend any particular approach for adoption in a European context. It was therefore decided to set up pilot-schemes to determine the level of collaboration that could be achieved among the very numerous European collections, and the nature of the difficulties likely to be encountered. This report covers the pilot-scheme for flowering

plants, which was organised and co-ordinated from the Royal Botanic Garden, Edinburgh (another pilot-scheme, involving Diatoms, is being organised by Dr. RIEDL).

In order to carry out the survey, two sets of choices were necessary: 1) a taxonomic group to be surveyed; and, 2) the nature of the descriptors to be used. It was agreed from the outset that the scheme should be as simple as possible so that curators of herbaria should not be overwhelmed by the amount of work involved. This meant, in practice, that curators should be asked to provide information about those specimens in their collections which were thought to be types (i.e. were marked or segregated in some way), with the minimum possible reference to literature. The minimum list of descriptors was agreed as: 1) Name of taxon of which the specimen is type (not the currently accepted name); 2) the country of origin of the specimen according to modern political geography; 3) the collector's name and number, if any; 4) the date of collection; and 5) the status of the specimen (i.e. holotype, isotype, lectotype, etc.).

The taxonomic group chosen for the survey would have to fulfil certain conditions: *a*) be of reasonable size, but not so large that the survey would be beyond the scope of a pilot-scheme (a size of about 200 species was thought appropriate); *b*) be of wide distribution, but have a substantial European component; and *c*) be reasonably well-known taxonomically. No taxonomic group fits these conditions ideally, but the one used, the *Papaveraceæ* sensu stricto, is adequate (about 200 currently recognised species, widely distributed, though absent from the African and Asian tropics and much of the southern hemisphere, common in Europe).

METHOD

In April 1974 a letter was sent out to all the European herbaria listed in *Index Herbariorum* ed. 5, 1964 —288 in all— explaining the project and asking curators to reply with lists of specimens by October 1, 1974. This letter was sent in English, French or German, as appropriate. A reminder letter was sent out to certain large herbaria in August. By October 6, the data on which the survey was completed, replies had been received from 82 herbaria (about 30 %), including most of the larger. The type of reply received can be tabulated as follows:

Herbaria with types	35
Herbaria with no types	33
Herbaria unable to participate at present*	8
Put in from literature	2
Letters returned by postal authorities	4

* Mainly due to herbarium reorganisation or lack of staff.

The information provided was put on to cards, using the following format:

ESCHSCHOLTZIA APICULATA Greene	B BP BR K.	BAKER 3088
U.S.A.	1903	

which allowed for the listing of the information in various orders. The replies received covered 500 taxa represented by 600 gatherings.

PRESENTATION

The information is presented as a master list (not reproduced in our introduction), including all the details provided, arranged alphabetically by the names of the taxa; and two indexes, one arranged by collector's names, the other by herbaria. These were thought to be the most useful arrangements. Other listings (e. g. by country of origin, or date of collection) are possible, but do not seem to be of any great value.

Copies of the list have been sent to members of the Working Party and other will be sent to all the contributing herbaria.

CONCLUSIONS

The level of collaboration (30 %) is quite high, as the 82 herbaria participating, or willing to participate, include all the larger ones. Smaller herbaria with small staffs could probably annotate a listing of this type more easily than they could produce the information *de novo*.

Curators were asked to comment on the scheme, and in particular to mention the difficulties they encountered. Comment covered a wide spectrum, and the extracts below indicate the range:

" The project will be extremely useful to all botanists. "

" ... it would be better if taxonomists spent their time actually doing taxonomy. "

" Many herbaria have types unmarked so it is necessary to some extent for them to go through the literature. " (a comment made, in various forms, by several curators).

" The change from label geography to current political geography can be time-consuming ".

" Great difficulty is experienced in deciding the status of the type. " (also repeated by several curators.)

These comments, on the whole, speak for themselves. The final one mentioned, the problem of deciding the status of the types, is common

to all herbaria, so only the holotypes (where claimed) are mentioned in the master list.

The amount of time spent in extracting the information was mentioned by several collaborators, as follows:

B: 60 working hours.
BM: about 1 ½ minute per specimen.
GOET: 2 working hours.
K: one senior staff member, 10 hours.
L: done twice: a technical officer took 1 hour and extracted 2 specimens, a senior member of staff took 8 hours and extracted 20 specimens.
M: 24 working hours.

The time spent at Edinburgh on the organisation and coordination of the project was 30 hours for an assistant (Miss L. McLuckie, to whom thanks are due for her considerable efforts) and, for myself, one working week (42 hours).

DISCUSSION AT LEIDEN ON THE PILOT-PROJECT

Discussion centred on the pilot-project on the types of the Papaveraceæ already carried out. The group felt that the response from the European herbaria had been good and that the exercise was worthwhile, showing that a more widely based scheme was feasible.

J. Raynal remarked on the fact that no E.D.P. had been used in the pilot-project and felt that this was perhaps a mistake, in view of the operations and name of the working party. The Chairman agreed but pointed out that the pilot scheme was undertaken to determine what level of collaboration could be achieved among the European herbaria; the possibility of applying E.D.P. methods to such a simple, though voluminous, task was not in question.

Dr. Riedl explained some of the difficulties encountered in organising a similar pilot project for microscopic cryptogams but reiterated his intention to pursue the matter further. The Chairman mentioned the existence of an unpublished type register of the Bolbitiaceæ (a small group of Basidiomycetes).

It was agreed that work on the Papaveraceæ project should continue in its present form and J. Raynal (Paris) and Dr. Burdet (Geneve) agreed to provide additions from their institutions[1].

It was further agreed that the pilot project had shown that the task of producing a type-register, though large, was possible and that a recommendation to this effect should be presented at the Leningrad Congress.

J. Cullen
Chairman, Type-Register Group.